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Supplement of

ModE-Sim – a medium-sized atmospheric general circulation model (AGCM) ensemble to study climate variability during the modern era (1420 to 2009)

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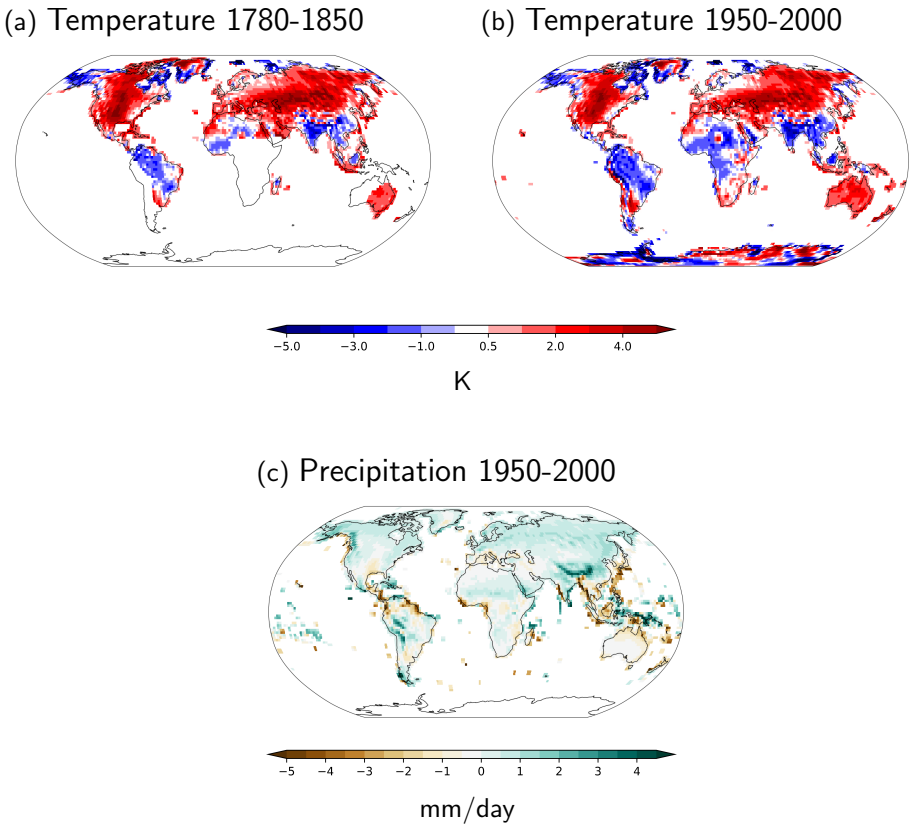

Figure S 1: Mean state bias of ModE-SIM for (a) 2m temperature w.r.t. Berkeley Earth for the Period 1780 to 1850 (in K), (b) 2m temperature w.r.t. Berkeley Earth for the Period 1950 to 2000 (in K), and (c) precipitation w.r.t. GPCC (in mm/day)

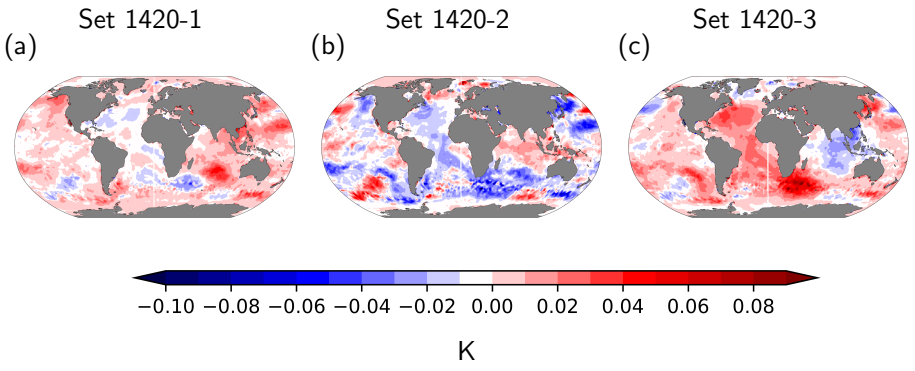

Figure S 2: Difference between the temporally averaged overall ensemble mean SST forcing and the subensemble mean SST forcing computed for each set separately (in K).

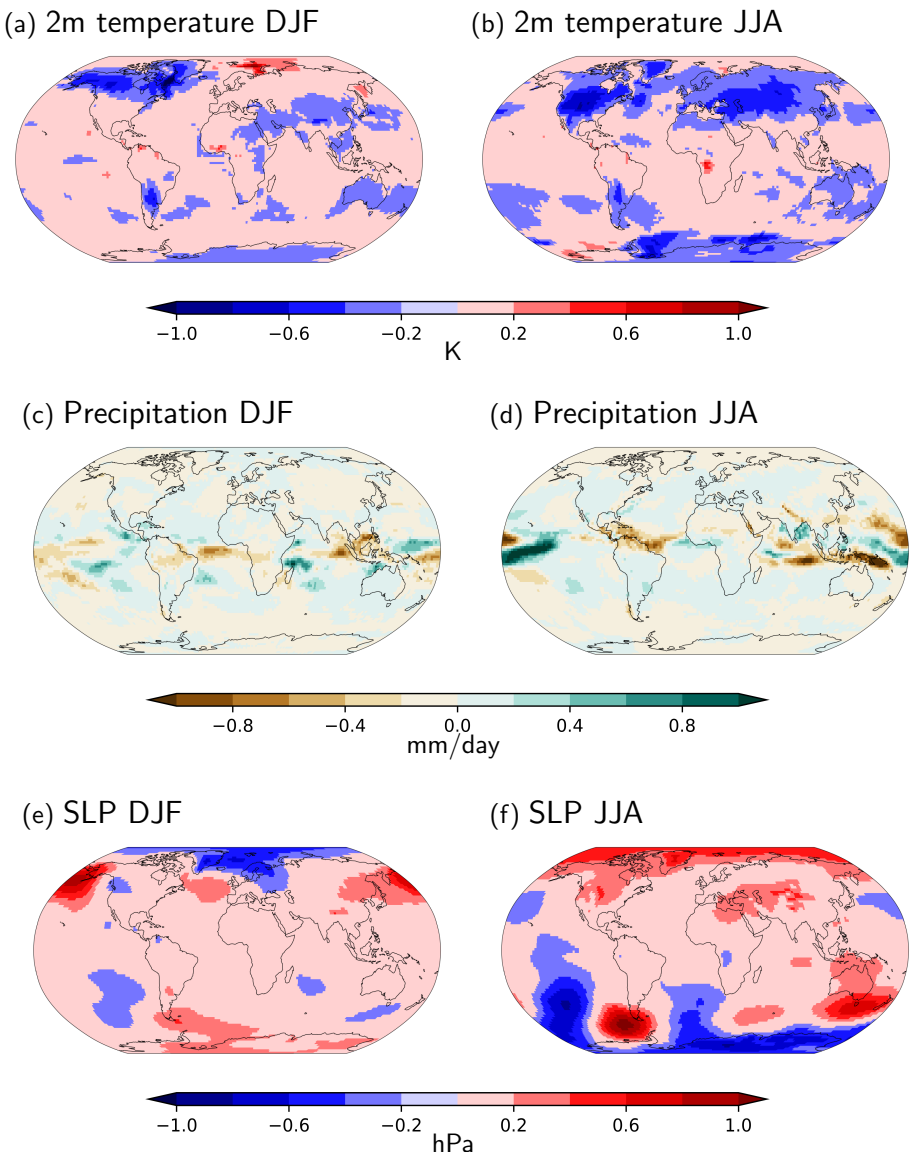

Figure S 3: Response to volcanic forcing averaged over 15 maior eruptions. Difference between the ensemble mean of the second winter (DJF, left column) and summer (JJA, right column) after an eruption for 2m temperature (top), precipitation (middle) and sea level pressure (bottom) and the same quantity avaraged over the 5 previous summers/winters.

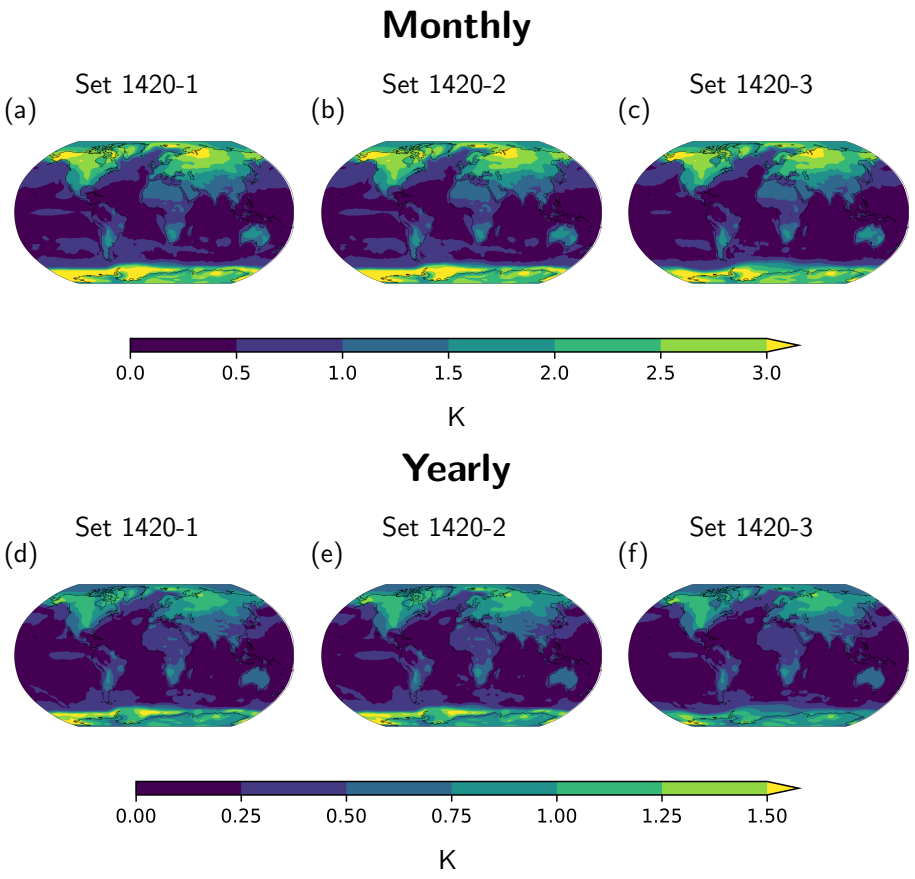

Figure S 4: Ensemble spread of 2m temperature (in K) on monthly (upper row) and yearly (lower row) timescale. The ensemble standard deviation was computed for each set separately and temporally averaged over the period 1420-1780.

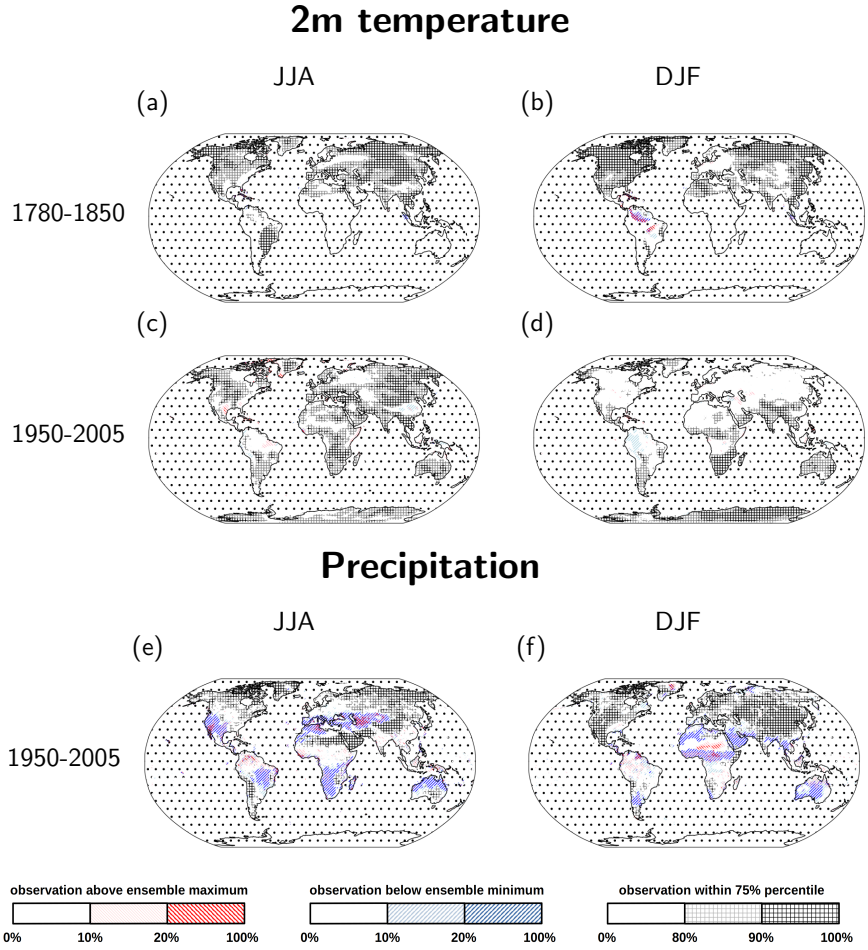

Figure S 5: Ability of ModE-Sim to capture internal variability for 2m temperature in the period 1780 to 1850 (upper row) and 1950 to 2005 (middle row) and precipitation (lower row) for wintermeans (DJF, left) and summermeans (JJA, right) timescales. Light red (dark red) shadings indicate regions where Berkeley Earth (for temperature) respectively GPCC (for precipitation) observations lie below the ensemble maximum of the for more than 10% (20%) of the time steps, light blue and dark blue shadings indicate regions where the observations are below the ensemble minimum accordingly. The grey hatching indicates regions where the ensemble overestimates internal variability, i.e. where more than 80% (light grey hatching) respectively 90% (black hatching) of the time steps fall within the 12.5 to 87.5 percentile range.

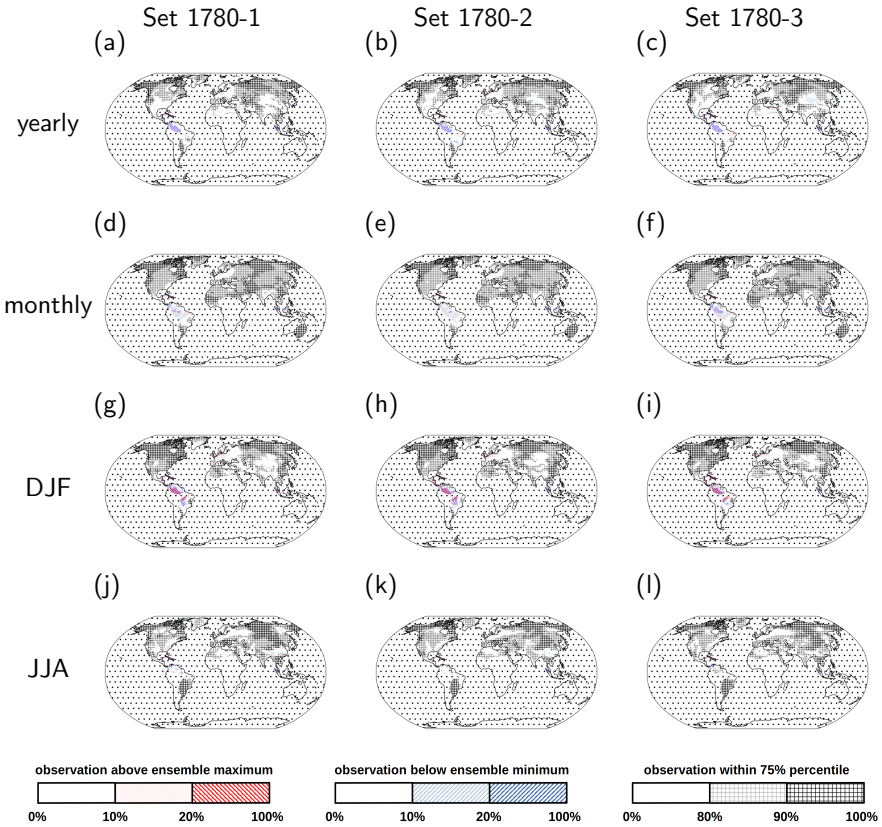

Figure S 6: Ability of the individual sets of ModE-Sim to capture internal variability for 2m temperature in the period 1780 to 1850 for yearly means (a-c), monthly means (d-f), winter means (g-i) and summer means (j-l). Left column shows the results for set 1780-1, the middle column for set 1780-2, and the right column for set 1780-3. Light red (Dark red) shadings indicate regions where Berkeley Earth (for temperature) respectively GPCC (for precipitation) observations lie below the ensemble maximum of the for more than 10% (20%) of the time steps, light blue and dark blue shadings indicate regions where the observations are below the ensemble minimum accordingly. The grey hatching indicates regions where the ensemble overestimates internal variability, i.e. where more than 80 (light grey hatching) respectively 90 (black hatching) % of the time steps fall within the 12.5 to 87.5 percentile range.